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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/725,769	12/02/2003	Stuart M. Lindsay	10060298-2	3836

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EXAMINER

LIVEDALEN, BRIAN J

ART UNIT	PAPER NUMBER
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2878

NOTIFICATION DATE	DELIVERY MODE
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05/07/2008

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

IPOPS.LEGAL@agilent.com

Office Action Summary

Application No.

10/725,769

Applicant(s)

LINDSAY ET AL.

Examiner

BRIAN J. LIVEDALEN

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 April 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13 and 15 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-13 and 15 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/CDC)
- 4) ☐ Interview Summary (PTO-413)
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____
- Paper No(s)/Mail Date _____

DETAILED ACTION

This action is in response to the amendment filed 4/7/2008. Claims 1-13 and 15 are pending.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-6, 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Funakubo (JP 62105440, see English translation) in view of Watanabe et al. (5371365), Barrett (5210410), and Sarkar (6806991).

In regard to claims 1 and 12, Funakubo discloses (fig. 1) a fast scanning stage for a scanning probe microscope, the scanning probe microscope including a probe (page 3, lines 21-30), the fast scanning stage comprising, a fixed support (19, 11), and a sample stage (17) having at least one axis of translation, the sample stage being affixed to the fixed support by means for causing displacement (18) of the sample stage relative to the probe (page 6, lines 14-34). Funakubo fails to disclose the specific voltage value applied to actuate the stage. However, Watanabe discloses a stage (2) having actuators (3,4), wherein a voltage less than 100 volts is applied to actuate the stage (column 10, lines 13-28). Furthermore, it is well known in the art to drive either a stage or probe at any desired voltage according to the size of the stage and desired amplitude. It would have been obvious to one of ordinary skill in the art at the time the

invention was made to use a voltage less than 100 volts as taught by Watanabe in order to drive the stage at the desired amplitude and to reduce power consumption.

Funakubo further fails to specify the kind of microscope used in the system. However, Watanabe further discloses using an atomic force microscope to measure the properties of a sample (column 16, lines 14-17). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the system of Funakubo in an atomic force microscope as taught by Watanabe, in order to maximize imaging resolution. Funakubo in view of Watanabe fails to disclose that the resonant frequency of the microscope is between about 500 Hz and 5 kHz. However, Barrett discloses an atomic force microscope with a resonant frequency between about 500 Hz and 5 kHz (column 1, lines 15-36). It would have been obvious to one of ordinary skill in the art at the time the invention was made to make the resonant frequency of the microscope of Funakubo in view of Watanabe to be between about 500 Hz and 5 kHz as taught by Barrett, in order to choose the a resonant frequency appropriate to the measured sample and desired mechanical response. Funakubo in view of Watanabe and Barrett fails to disclose multiple actuator elements between the fixed support and the sample stage. However, Sarkar discloses (fig. 2) a stage that has a rectangular configuration and that has four actuator elements supporting the stage (203a-d and 201a-d) (column 4, lines 10-49). It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Funakubo in view of Watanabe and Barrett by attaching multiple actuators to the stage in order to enhance movement and stability of the stage.

In regard to claim 2, Funakubo discloses (fig. 1) a fast scanning stage for a scanning probe microscope, the scanning probe microscope including a probe (page 3, lines 21-30), the fast scanning stage comprising, a fixed support (19, 11), and a sample stage (17) having at least one axis of translation, the sample stage being affixed to the fixed support by means for causing displacement (18) of the sample stage relative to the probe (page 6, lines 14-34); and in which the means for causing displacement of the sample include at least one actuator element (18) supporting the stage and a sine waveform generator (fig. 4, 62) for actuating the at least one actuator element (page 5, lines 4-10; page 6, lines 1-3; page 7, lines 19-36; page 9, lines 16-28). Funakubo fails to disclose the specific voltage value applied to actuate the stage. However, Watanabe discloses a stage (2) having actuators (3,4), wherein a voltage less than 100 volts is applied to actuate the stage (column 10, lines 13-28). Furthermore, it is well known in the art to drive either a stage or probe at any desired voltage according to the size of the stage and desired amplitude. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a voltage less than 100 volts as taught by Watanabe in order to drive the stage at the desired amplitude and to reduce power consumption. Funakubo further fails to specify the kind of microscope used in the system. However, Watanabe further discloses using an atomic force microscope to measure the properties of a sample (column 16, lines 14-17). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the system of Funakubo in an atomic force microscope as taught by Watanabe, in order to maximize imaging resolution. Funakubo in view of Watanabe

fails to disclose that the resonant frequency of the microscope is between about 500 Hz and 5 kHz. However, Barrett discloses an atomic force microscope with a resonant frequency between about 500 Hz and 5 kHz (column 1, lines 15-36). It would have been obvious to one of ordinary skill in the art at the time the invention was made to make the resonant frequency of the microscope of Funakubo in view of Watanabe to be between about 500 Hz and 5 kHz as taught by Barrett, in order to choose the a resonant frequency appropriate to the measured sample and desired mechanical response. Funakubo in view of Watanabe and Barrett fails to disclose multiple actuator elements between the fixed support and the sample stage. However, Sarkar discloses (fig. 2) a stage that has a rectangular configuration and that has four actuator elements supporting the stage (203a-d and 201a-d) (column 4, lines 10-49). It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Funakubo in view of Watanabe and Barrett by attaching multiple actuators to the stage in order to enhance movement and stability of the stage.

In regard to claim 4, Funakubo discloses (fig. 1) a fast scanning stage for a scanning probe microscope, the scanning probe microscope including a probe (page 3, lines 21-30), the fast scanning stage comprising, a fixed support (19, 11), and a sample stage (17) having at least one axis of translation, the sample stage being connected to at least one actuator element (18), a sine wave generator (fig. 4, 62) for actuating the at least one actuator element, in which the stage is displaced by the at least one actuator element being driven at the frequency of resonant vibrating corresponding to translation of the sample with respect to the probe (page 5, lines 4-10; page 6, lines 1-34; page 7,

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lines 19-36; page 9, lines 16-28). Funakubo fails to disclose the specific voltage value applied to actuate the stage. However, Watanabe discloses a stage (2) having actuators (3,4), wherein a voltage less than 100 volts is applied to actuate the stage (column 10, lines 13-28). Furthermore, it is well known in the art to drive either a stage or probe at any desired voltage according to the size of the stage and desired amplitude. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a voltage less than 100 volts as taught by Watanabe in order to drive the stage at the desired amplitude and to reduce power consumption.

Funakubo further fails to specify the kind of microscope used in the system. However, Watanabe further discloses using an atomic force microscope to measure the properties of a sample (column 16, lines 14-17). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the system of Funakubo in an atomic force microscope as taught by Watanabe, in order to maximize imaging resolution. Funakubo in view of Watanabe fails to disclose that the resonant frequency of the microscope is between about 500 Hz and 5 kHz. However, Barrett discloses an atomic force microscope with a resonant frequency between about 500 Hz and 5 kHz (column 1, lines 15-36). It would have been obvious to one of ordinary skill in the art at the time the invention was made to make the resonant frequency of the microscope of Funakubo in view of Watanabe to be between about 500 Hz and 5 kHz as taught by Barrett, in order to choose the a resonant frequency appropriate to the measured sample and desired mechanical response. Funakubo in view of Watanabe and Barrett fails to disclose multiple actuator elements between the fixed support and the sample

stage. However, Sarkar discloses (fig. 2) a stage that has a rectangular configuration and that has four actuator elements supporting the stage (203a-d and 201a-d) (column 4, lines 10-49). It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Funakubo in view of Watanabe and Barrett by attaching multiple actuators to the stage in order to enhance movement and stability of the stage.

In regard to claim 13, Funakubo discloses (fig. 1) a method of operating a fast scanning stage for a scanning probe microscope, the scanning probe microscope including a probe (page 3, lines 21-30), providing a sample stage (17) having a sample thereon and causing displacement of the sample on the sample stage relative to the probe by actuating at least one actuator element (18) to drive the stage at the resonant frequency of the sample stage using a sine waveform generator (fig. 4, 62) (page 5, lines 4-10; page 6, lines 1-34; page 7, lines 19-36; page 9, lines 16-28). Funakubo fails to disclose the specific voltage value applied to actuate the stage. However, Watanabe discloses a stage (2) having actuators (3,4), wherein a voltage less than 100 volts is applied to actuate the stage (column 10, lines 13-28). Furthermore, it is well known in the art to drive either a stage or probe at any desired voltage according to the size of the stage and desired amplitude. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a voltage less than 100 volts as taught by Watanabe in order to drive the stage at the desired amplitude and to reduce power consumption. Funakubo further fails to specify the kind of microscope used in the system. However, Watanabe further discloses using an atomic force microscope to

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measure the properties of a sample (column 16, lines 14-17). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the system of Funakubo in an atomic force microscope as taught by Watanabe, in order to maximize imaging resolution. Funakubo in view of Watanabe fails to disclose that the resonant frequency of the microscope is between about 500 Hz and 5 kHz. However, Barrett discloses an atomic force microscope with a resonant frequency between about 500 Hz and 5 kHz (column 1, lines 15-36). It would have been obvious to one of ordinary skill in the art at the time the invention was made to make the resonant frequency of the microscope of Funakubo in view of Watanabe to be between about 500 Hz and 5 kHz as taught by Barrett, in order to choose the a resonant frequency appropriate to the measured sample and desired mechanical response. Funakubo in view of Watanabe and Barrett fails to disclose multiple actuator elements between the fixed support and the sample stage. However, Sarkar discloses (fig. 2) a stage that has a rectangular configuration and that has four actuator elements supporting the stage (203a-d and 201a-d) (column 4, lines 10-49). It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Funakubo in view of Watanabe and Barrett by attaching multiple actuators to the stage in order to enhance movement and stability of the stage.

In regard claims 3 and 5, Funakubo in view of Watanabe, Barrett, and Sarkar discloses in Sarkar (fig. 1), a fast scanning stage wherein the sample stage has a square or rectangular configuration with four actuator elements supporting the stage (203a-d and 201a-d) at each corner of the stage (column 4, lines 10-49).

In regard to claim 6, Funakubo in view of Watanabe, Barrett, and Sarkar discloses that the actuator elements form a parallelogram scanning element.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Funakubo (JP 62105440) in view of in view of Watanabe et al. (5371365), Barrett (5210410), and Sarkar (6806991) as applied to claim 6, and in view of Pai et al. (6338249).

In regard to claim 7, Funakubo in view of Watanabe, Barrett, and Sarkar discloses (fig. 2) multiple actuators that translate the stage in two directions. Funakubo in view of Watanabe, Barrett, and Sarkar remain silent regarding the actuators being electrically in parallel. However, Pai discloses a system using multiple actuators (20) that are electrically in parallel to move a single element (110) (column 3, lines 5-10). It would have been obvious to one of ordinary skill in the art at the time the invention was made to put the actuators electrically in parallel in order to control the actuators independent from each other.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Funakubo (JP 62105440) in view of Watanabe et al. (5371365), Barrett (5210410), and Sarkar (6806991) as applied to claim 2, and in view of Erlings (US RE37560).

Regarding claim 8, Funakubo in view of Watanabe, Barrett, and Sarkar discloses a translational stage displaced by piezoelectric stack actuators (page 6, lines 21-25). Funakubo in view of Watanabe, Barrett, and Sarkar remains silent regarding the actuator being a stack-bending element. However, Erlings teaches that piezoelectric

stacks are commonly used in displacing a stage for a scanning microscope (column 1, lines 17-30). It would have been obvious to one of regular skill in the art at the time the invention was made to include the stack actuators of Erlings to the translational stage of Funakubo in view of Watanabe, Barrett, and Sarkar to actuate larger displacements.

Claims 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Funakubo (JP 62105440) in view of Watanabe et al. (5371365), Barrett (5210410), and Sarkar (6806991) as applied to claims 2 and 3, and in view of Zdeblick (US 4906840).

Regarding claims 9 and 10, Funakubo in view of Watanabe, Barrett, and Sarkar discloses a stage moveable by at least one piezoelectric stack actuator (page 6, lines 21-25). Funakubo in view of Watanabe, Barrett, and Sarkar is silent regarding a pzt bimorph actuator. However, Zdeblick discloses a pzt bimorph actuator (cantilever, fig 9) that actuates the tip of a probe (column 2, lines 43-48). It would have been obvious to one of regular skill in the art at the time the invention was made to include the pzt bimorph actuator of Zbedlick to the stage of Funakubo in view of Watanabe, Barrett, and Sarkar to apply the precise movement of Zbedick's probe to the motion of the stage.

Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Funakubo (JP 62105440) in view of Watanabe et al. (5371365), Barrett (5210410), and Sarkar (6806991) as applied to claim 1, and in view of Marchman (US 5811796).

Regarding claim 11, Funakubo in view of Watanabe, Barrett, and Sarkar discloses (fig. 1) a scanning probe microscope with a moveable stage. Funakubo in view of Watanabe, Barrett, and Sarkar remains silent regarding the material of the stage. However, Marchman discloses a scanning microscope including a probe (column 5, line 22), and a stage (27) having at least one axis of translation and means for causing displacement of the stage relative to the probe (column 5, lines 57-column 6 line 24). Marchman further discloses the stage (disc, 27)) being made out of a ceramic material (fig 2A, column 6, lines 32-37). It would have been obvious to one of regular skill in the art at the time the invention was made to make the stage of Funakubo in view of Watanabe, Barrett, and Sarkar out of ceramic material in order to inexpensively produce a durable stage.

Claim 15 rejected under 35 U.S.C. 103(a) as being unpatentable over Funakubo (JP 62105440) in view of Watanabe et al. (5371365), Barrett (5210410), and Sarkar (6806991) as applied to claim 13, and in view of the publication of Ando et al (A High-Speed Atomic Force Microscope for studying biological macromolecules).

Regarding claim 15, Funakubo in view of Watanabe, Barrett, and Sarkar discloses a stage that is displaced at a resonant frequency. Funakubo in view of Watanabe, Barrett, and Sarkar is silent regarding the stage having a resonant frequency at $1/100^{\text{th}}$ of the probe's frequency. Ando teaches the actuator of a scanner having a resonant frequency at 8.5 kHz, 34 kHz, and 100 kHz (paragraph entitled: Imaging Bandwidth). Ando further discloses the probe having a resonant frequency of 2.5 MHz

(paragraph entitled: Discussion). This range provided for the ratio of frequencies is provides about $1/100^{\text{th}}$. It would have been obvious to one of regular skill in the art at the time the invention was made to actuate the stage and probe of Funakubo in view of Watanabe, Barrett, and Sarkar in a relationship taught by Ando to increase the imaging bandwidth.

Response to Arguments

Applicant's arguments filed 4/7/2008 have been fully considered but they are not persuasive. Applicant contends that Barrett fails to teach the claimed range between about 500 Hz to about 5 kHz. Applicant states, "Barrett discloses a single resonant frequency of 2 kHz and provides no suggestion or motivation to use a resonant frequency higher or lower than 2 kHz." However, the claim language, "a scanning resonance frequency between . . ." only requires one frequency within the range, not the entire range. Accordingly, Barrett properly teaches this limitation.

In regard to the combination of Funakubo in view of Watanabe, Barrett, and Sarkar, Applicant asserts that Sarkar "fails to disclose four actuator elements that support the sample stage." However, Sarkar is only employed to teach using multiple actuator elements. The other references already teach an actuator that supports the stage. Furthermore, the claims do not require direct support by the actuator elements, so the fact that Sarkar discloses flexures between the actuator elements and the stage is inconsequential. For these reasons, the rejection above is proper.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian J. Livedalen whose telephone number is (571) 272-2715. The examiner can normally be reached on 7:30 am to 4:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Georgia Epps can be reached on (571) 272-2328. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

bjl

/Georgia Y Epps/

Supervisory Patent Examiner, Art Unit 2878